The migrations of the Arctic Tern

by W. R. P. Bourne & M. B. Casement

Received 21 May 1995

The deduction by Villaseñor & Phillips (1994) that Arctic Terns *Sterna paradisaea* must migrate unseen overland across North America, as already implied by the records plotted by Storr (1958), raises the question what may happen elsewhere. While information on the distribution of the species throughout the world has been summarised by Salomonsen (1967) and Dunn (1985), and the problem of their migration overland in the Old World has been discussed by Alerstam (1985), most attention has been paid to possible movements around the margins of the oceans, and less to any over either the land or open sea. It may therefore be useful to review some comparable records collected at sea over nearly half a century by the Royal Naval Bird-watching Society, both at the British North Atlantic Weather Ships and in their Sea Repors, summarised in its Annual Report *Sea Swallow* (SS) and Figure 1, and some similar inland observations in the Palearctic.

The first problem which arises is the reliability of identifications. While nesting Arctic Terns in breeding plumage may be easy to identify where they characteristically assault observers and allied species are absent, in the Arctic, or where they moult in the pack-ice surrounding the Antarctic, their identification is more difficult along the intervening coasts, where they occur with a number of other closely-related "commic" terns in a protean variety of non-breeding plumages; and despite improved identification (P. J. Grant *et al.* in Sharrock 1980, Harrison 1983) many birds often remain unidentified.

The situation is however simplified by the rarity of allied species far out at sea, where for example of some hundreds of birds that Bourne saw well enough to identify reliably in the centres of both the North and South Atlantic Oceans all appeared to be Arctic, showing a short head and red bill but long tail and dark-edged wing in the air, and red bill, grey underparts and short legs when standing on flotsam in breeding plumage, and a light build and comparatively indistinct greyish markings in the minority in other plumages. Representative RNBWS records are plotted on Figure 1.

Most observations come from the British Ocean Weather Ships stationed in area A (Fig. 1). The total numbers of terns seen here between 1966 and 1973 when there were still four ships on station are shown in Table 1, which indicates that Arctic Terns appear to predominate and other species are indeed scarce out at sea. Arctic Terns have been reported here in every month except January, but usually first appeared in late April, reached a climax in August, when most flew SW, and were last seen in October. About an eighth of a flock of 200 seen at Station India (59°N, 19°W) on 11 August 1971 were immature, with black bills and legs, white foreheads and underparts, and short tails, though there were many adults with red bills and dusky underparts (SS 22: 26). On the other hand, only about a quarter of a

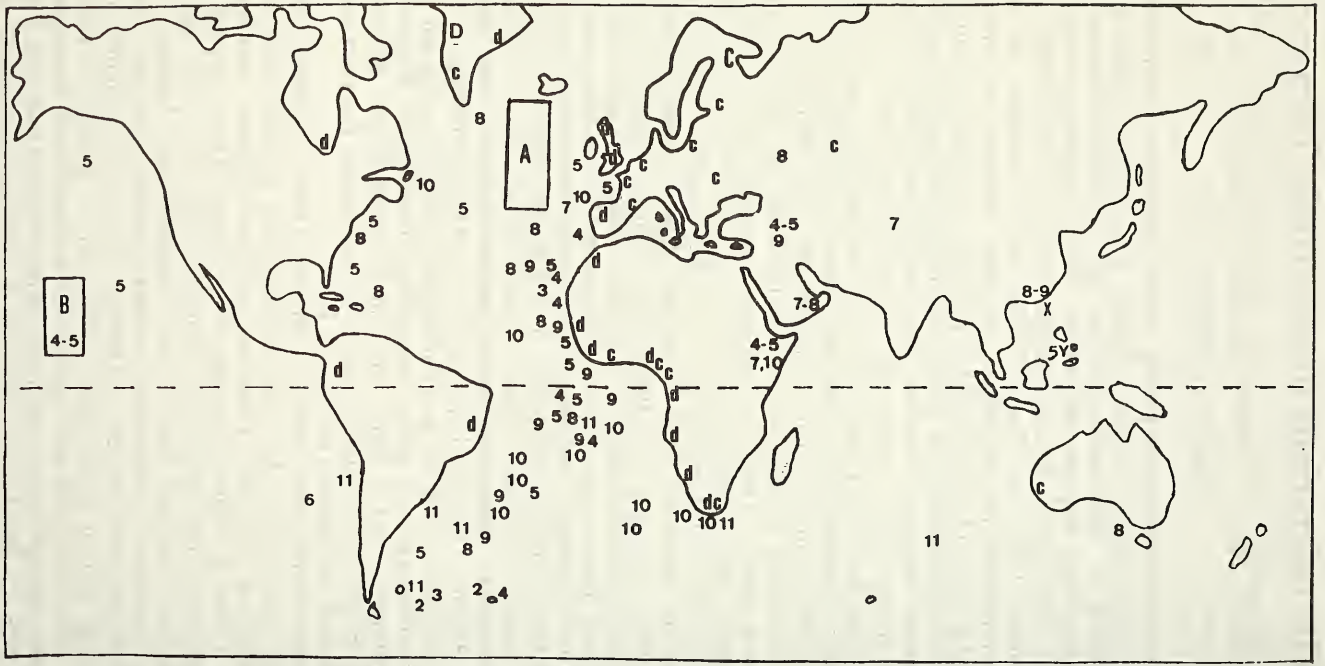

Figure 1. Months when "commic" (when identified, usually Arctic) terns have been recorded by the Royal Naval Bird-watching Society at sea: A, location of North Atlantic Weather Ships (Table 1). B, Trade Wind Zone Oceanography Pilot Study (King 1970). C, Kandelaksha Bay; some distant recoveries c (Bianki 1967). D, Western Greenland (Alerstam *et al.* 1986); distant recoveries d. Aleutian Terns: X, observed in autumn (*Oriental Bird Club Bull.* 17: 50). Y, collected in spring (Lee 1992).

TABLE 1.
Terns *Sterna* spp. at the North Atlantic Weather Ships 1966–1973 (from summaries by J. H. Agnew in *Sea Swallow*).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.
Arctic	1	1	1	1	1	7	40	2324	36	4
Common						1		3		
Roseate							1			
Little									2	
Sandwich									1	
Unidentified		1		3	48	73	213	1682	147	61
Totals	1	2	1	4	49	81	254	4009	186	65

long, straggling group of over 1000 terns and 100 Manx Shearwaters *Puffinus puffinus* followed White-sided Dolphins *Lagenorhynchus acutus* and Pilot Whales *Globicephala melaena* west there on 28 August 1973 were adult (SS 24: 29). Although Wynne-Edwards (1935) reported that they do not settle on the sea, a group sat on the water to bathe and preen on 17 August 1972, twice rising to mob Great and Arctic Skuas *Catharacta skua* and *Stercorarius parasiticus* (SS 23: 33), and they often sit on drifting objects.

Individuals and smaller groups of "commic" terns may also be seen on migration across the whole width of the North Atlantic (Wynne-Edwards 1935, Bourne 1986, Danielsen *et al.* 1990), along the west coast of Europe, and over the Canary Current off West Africa and the Gulf Stream off eastern North America, where more have been recorded in the spring than the autumn (Lee & Cardiff 1993). Flocks have also often been seen where Salomonsen (1967: 7) speculated that they stop to feed along the equatorial counter-current in the tropical Atlantic, where one mixed flock of seabirds seen well at 03.2°S, 15.2°W on 26 April 1982 by W. F. Curtis was thought to include 75 Sooty *Sterna fuscata*, 25 Arctic, 5 Common *S. hirundo*, 3 Roseate *S. dougallii*, 20 unidentified "commic" terns, and 35 Brown Noddies *Anous stolidus*. A Common Tern ringed in Germany has been recovered at 0.8°N, 18.1°W in January (Muselet 1982), and a number of young Sooty Terns ringed on the Dry Tortugas off Florida in the same area throughout the year (Robertson 1969).

"Commic" terns have also been found during recent voyages between Britain and the Falklands to be widespread on migration in the South Atlantic (Bourne & Curtis 1985; Fig. 1), though here their identification is further complicated by the possible presence of southern species such as the similar Antarctic Tern *Sterna vittata*, since although it is not normally reported north of 30°S there is a specimen in the British Museum (Natural History) said to have been taken between Ascension and St. Helena in the last century (Saunders 1876), though no others have been reported out at sea. We have fewer records elsewhere, but they confirm that some Arctic Terns reach Australasia, where for example Bourne saw two immature birds at

35.6°S, 140.8°E over the edge of the continental shelf off Portland, Victoria, on 1 August 1974. If they stay so far out to sea this may explain a shortage of records in this area. They also occur in the eastern Pacific, where King (1970) reported that they were common on spring migration in area B of Figure 1 in late April and May 1964–65, with others collected further west.

Arctic Terns also appear to cross the Old World as well as North America. Bianki (1967) reported that while most distant recoveries of birds ringed in Kandelaksha Bay of the White Sea (Fig. 1, C) and around the Baltic occurred in the Atlantic, with one in Western Australia and one in the east Antarctic, two fledglings were recovered in August in Russia and the Ukraine (Fig. 1, c). There are also reports from the Bosphorus (Ballance & Lee 1961) and possibly Cyprus (Flint & Stewart 1992) in September (Fig. 1), and old records from the Ukraine in October (Dementiev *et al.* 1951). On the return migration Ash (1983) reports a northerly movement inland from the east coast of Somalia in late April and May, when there are also records in Cyprus (Flint & Stewart 1992) and Turkey, where they have been photographed at nearly 2000 m on Lake Van (Ornithological Society of Turkey 1972, 1975; Fig. 1), though birds have remained in Somalia until July and October (Ash 1983), Masirah Island, Oman, until July and August (Oman Bird Records Committee, 1994; Fig. 1), and one has been collected with Common Terns at nearly 5000 m in Kashmir in July (Whistler 1936).

Thus if the full extent of the transequatorial migration of the Arctic Tern is considered (Storr 1958, Salomonsen 1967, Dunn 1985), it appears that they are widespread in the local summer in both the north and south polar regions, and their main movement between them appears to occur over those parts of the intervening area with a comparatively stable meteorological regime of westerlies and trade-winds. They appear to avoid the area with alternating monsoons around S.E. Asia, where they may be replaced by the Aleutian Tern *Sterna aleutica*, which has recently been reported at Hong Kong in the autumn and in the Philippines in the spring (*Oriental Bird Club Bull.* 17: 50, Lee 1992; Fig. 1), and presumably winters somewhere to the south. Alerstam (1985) has already postulated in the light of such records that like many other Charadriiformes Arctic Terns must carry out their migrations by a series of long flights between a succession of good feeding places. These appear to include the areas of marine turbulence where nutrients and plankton are brought to the surface by vertical water movements, leading to the presence of many invertebrates and small fish around ice in the polar regions, along the marine fronts over the continental shelves, over eddies in the boundary currents offshore, and over upwelling along the subtropical convergences in middle latitudes and equatorial current systems.

Their progress seems more leisurely in the autumn, when Bianki (1967) reported that birds ringed in the Kandelaksha Bay of the White Sea and the Baltic usually appear to move south down the east side of the Atlantic, though some may go south overland. Alerstam (1985) has described how those passing through the Baltic area fly WSW at

heights exceeding 1000 m across Scandinavia, and Alerstam *et al.* (1986) how those ringed in western Greenland move SE towards western Europe, where numbers linger for a while offshore and according to RNBWS observations at the Weather Ships out at sea, presumably feeding before starting south. Observations with radar of a regular coasting movement attributed to terns in the autumn in Ghana (Grimes 1977) suggest that many of them may coast south offshore at this season as suggested by Storr (1958) and Salomonsen (1967), but the records summarised here and by Villaseñor & Phillips (1994) also indicate that at least some must go south over Eurasia and North America, and in the Pacific as well.

On the other hand, no similar coasting movements were detected with radar in Ghana in the spring (Grimes 1977), so it seems possible that after moulting in the Southern Ocean during the local summer the birds may then fly back north on a broader front from whatever point they may have reached, at least those in the Atlantic stopping to rest and feed after their migration and wait for good weather off western Europe and eastern North America before going on to the breeding grounds (Alerstam *et al.* 1986). This may explain some anomalous ringing recoveries, including two-year-olds bred in Britain which were recovered in Russia in June and July, other two-year-olds from the White Sea found in Greenland in July (Dunn 1985) and from Greenland found in Hudson's Bay in July, a three-year-old from Greenland found in the Brazilian highlands in May, and a ten-year-old from Greenland found at over 2000 m in the Colombian Andes in June (Alerstam 1985).

While Arctic Terns may often stop to feed with flocks of other species, on migration they are usually seen moving singly or in small parties on a broad front out at sea; they apparently cross any land in their way at altitudes of thousands of metres (Alerstam 1985). It seems probably that, like many other birds, they prefer to take off for the longer flights in good weather with tail winds, and fly high where the winds are stronger while they remain favourable, so that few are seen then. But they may descend, presumably because the winds are weaker at lower levels, and if necessary settle, when the winds become adverse (Alerstam 1985). Thus a wave of birds regularly crosses Britain with the onset of fine weather to the south in May, when a few descend briefly at such places as sewage farms (Hinde & Harrison 1949, Hinde 1951, personal observation), and there are larger influxes after westerly gales, as in 1947, 1985 and 1991 (Gibb 1948, Kramer 1995).

The need to adjust the altitude of flight and heading to minimise drift by the wind may explain why most birds were reported heading SW against the prevailing westerlies at the North Atlantic weather ships in the autumn when the ringing returns suggest they should have been heading SE, but a fledgling from New England was recovered in northern Scotland (Hawkesley 1949), and north into the prevailing NE trades in the western Atlantic (Lee & Cardiff 1993) and east Pacific (King 1970) in spring, whereas few or none are to be seen at these places when they may fly high with the more favourable NE trade winds in autumn and westerlies in spring.

Acknowledgement

We are indebted to Dr Euan Dunn for much assistance with the literature.

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Supernumerary rectrices

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Received 31 May 1995

In the past several years there has been a succession of papers on abnormal numbers of rectrices and remiges in birds, the most recent being that of Saini & Toor (1988). In that paper will be found a list of references to other papers on the subject, which will not be repeated here.

Saini & Toor state that "cases of anisorectricial birds have been reported in 45 species belonging to 16 families (Hammer 1985)". This wording gives the impression that this is the total number of such reports for all birds, whereas it is merely the figure for those birds that were handled by Hanmer and her colleagues in Malawi and Mozambique. It does not include abnormal rectrix numbers reported by other authors.

I have been waiting in vain for any of this series of papers to mention that I published a note on an "anisorectricial" specimen as long ago as 1950, but I can understand that authors based in Africa and Asia (as all of the authors of these recent papers have been) may not have access to the standard North American journals. I therefore depart from custom and repeat, in abridged form, the information published in that note (Parkes 1950).

Specimen no. 15791 in the collection of Cornell University, Ithaca, New York, is a Yellow-winged or Carmiol's Vireo *Vireo carmioli* collected by Austin Paul Smith at 9000 feet elevation on Volcán Turrialba, Costa Rica, on 24 November 1922. The specimen appears normal in all respects save that it possesses 15 rectrices, all fully grown with no basal sheathing. The three extra feathers are morphologically of the shape of the normal central pair, with the rachis centrally located. The follicles appear to have been duplicated laterally rather than dorsoventrally, making it difficult to determine which three of the five "central" rectrices are the supernumeraries.

Saini & Toor also state that "normally, birds have a species-specific fixed number of primaries, secondaries and rectrices". This is probably true for most passerines; with sample sizes ranging from 50 to 2238 for 30 passerine species, Hanmer recorded only 20 individuals, of 14